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NOTES ON EUROPEAN MUSEUMS.

OLIVER CUMMINGS FARRINGTON.

THE accompanying notes were first made with no thought of publication, they having been jotted down for purposes of a report to the Trustees of the Field Columbian Museum and for personal use during a hurried tour taken in the fall of 1898 among some of the principal natural history museums of Europe. Shortly after my return, however, being handed by Dr. Hovey a copy of his "Notes,"¹ I not only considered them to be of much interest and value, but was led to reflect on the scantiness of museum literature in general, and the probable utility of even small contributions to the subject. I have, therefore, arranged my rambling memoranda on a plan quite similar to that adopted by Dr. Hovey, but without repeating his observations where they resembled mine. For a like reason I have not followed the geographical order of my travels, but have given first my notes on museums not mentioned in his article.

¹ Hovey, Edmund Otis. Notes on Some European Museums, *Am. Nat.*, September, 1898.

Vienna. — The magnificent building of the Naturhistorisches Hofmuseum, which has been open to the public since 1889, is probably the most costly structure in the world devoted to purposes of a natural history museum. It is in the form of a hollow rectangle, 554 feet long and 230 feet broad. It is lighted from the side by numerous long windows. Only the outer two-thirds of the building is devoted to exhibition halls. The inner third is used for work and storage rooms, study collections, etc. This arrangement has the advantage of securing the best light for the exhibition halls and of making the work and storage rooms closely adjacent to the corresponding collections. It is also to be noted that the arrangement of the halls is such as to compel a consecutive line of progress from the single entrance and back to it again. A unique and pleasing feature of the interior decorations is the adornment of the walls of many of the halls by paintings which relate to or illustrate the collections. Of the thirty-nine halls, five are devoted to the mineralogical-petrological collections and five to the paleontological. The first hall of the mineralogical series contains what is termed a terminological collection in which the forms, properties, and genesis of minerals are illustrated. The two adjoining halls and part of a third contain the systematic mineral collection arranged according to Groth's system. The second of these halls contains as well the collection of precious stones and a collection of ores. The remainder of the third hall is occupied by a collection of building materials, marbles, etc., while in Hall No. 5 are the systematic rock collection and the world-famous collection of meteorites.

The cases adopted are, for the floors, desk cases of mahogany with pyramidal tops of low slope; for the walls, vertical cases of mahogany about 8 feet high and 2 feet deep, on bases 3 feet high. The floor cases accommodate only small specimens; the large specimens are shown in the wall cases. The case interiors are black. The method of mounting employed is that of black walnut blocks.

One difficult problem in mounting, *vis.*, a proper installation of cave specimens, seems to have been solved in this museum. The stalactites are fastened to individual wooden shelves pro-

jecting from the back of a wall case. The label, being then placed over the front of the shelf and projecting below it, hides any imperfection of the joint.

The collection showing varieties of marble is large and complete, and is the only collection which I saw in Europe having the different varieties fully and accurately labeled. Another commendable feature of the labeling of these and specimens of building stones is the use of a supplementary label (of a yellow color) upon which are mentioned important buildings or works of art in the construction of which the different stones have been used. The only criticism I would make on this collection is that the specimens are too small, being only 3 x 4 inches in size, to adequately represent the varieties. The marbles and building stones form a part of a collection of structural material, all of which is arranged geographically and is divided into the groups of road material, paving material, raw material for bricks, mortar, sand, raw material for cement, building stones, decorative stones, roofing slates, and marbles. Introductory to the systematic rock collection is a so-called terminological collection, made up of the following: rock-forming minerals, rock structures (amorphous, crystalline, conglomerate), varieties of structure of crystalline rocks, varieties of structure of clastic rocks, modifications of stratified rocks, modifications of massive rocks, accessory modifications, inclusions, and rocks of sedimentary, eruptive, and metamorphic origin. The classification adopted for the systematic collection is that of Kalkowsky, as given in his *Elemente der Lithologie*. The specimens are of the uniform size, 3 x 4 x 1 inches, and are labeled as to locality and species. Supplementary to this collection are suites of rocks from different volcanic regions, such as the island of Teneriffe, Bourbon, and Vesuvius. The great meteorite collection, which is not only the greatest of its kind in the world, but is also considered the most costly and valuable of any collection in the museum, is exhibited for the most part in floor cases of the uniform type, but some of the larger specimens are shown in two separate upright cases. The main collection is systematically arranged according to Tschermak's classification. There are also several accessory collections which illus-

trate the history of meteorites, their constituents, forms, and structures. The smaller specimens are mounted on circular, ebonized blocks, the larger ones on individual mounts adapted to each specimen.

In the paleontological division the arrangement of the collections is in order of time, beginning with the earliest and extending to the period of man. The fossil plants are placed in a series by themselves and occupy the first hall. With them are shown such indeterminate forms as *Arthropycus*, *Cruziana*, and *Bythotrephix*. In the next hall, seeming somewhat out of order, is a dynamical collection arranged on a classification of Professor Heim of Zurich, also large specimens of ripple marks, basalt columns, glacial markings, etc. There are also shown stratigraphic series arranged in vertical order. In the three remaining halls follow, in order, specimens of the faunas of the Paleozoic, Mesozoic, and Cenozoic ages, the last, of course, occupying much the largest relative space. Together with each of these are shown series of the typical rocks, chiefly from Austrian localities, of the strata of each age. The only feature of installation especially noted in the collection of fossils was the method employed for mounting incomplete skeletons. Black plaster forms having the shape of the body cavity and containing properly shaped depressions for each bone are prepared and the bones mounted on them. In this way the general form of the animal is presented to the eye and the bones are easily removable.

The museum is free to the public on Sundays, Thursdays, and holidays. Mondays, Wednesdays, and Saturdays payment is required of 1 krone (about 20 cents). A charge of 20 hellers (about 4 cents) is made for checking umbrellas, canes, etc.

Dresden.—The natural history collections are contained in the building of the rococo-baroque style of architecture which is the home as well of the art gallery so well known to European tourists. It is not to be expected that a building of this type would be well suited to the purposes of a natural history museum, and it is pleasing to note that plans for a new structure, expressly for the purposes of the natural history museum,

are already under way. Yet many of the peculiarities of the present building have been turned to good account in the present installation, and the museum furnishes a good illustration of how much a little ingenuity will do in overcoming limitations of space and light. The geological collections at the time of my visit were largely undergoing a change of installation so that I could not judge what their future appearance was to be. The zoölogical and ethnological collections were, however, quite fully installed. In these there was evidence of much thought and care in the installation, and many original and unique devices were to be seen. The cases are all of metal and glass, this being one of the few museums where this sort of case has been adopted. They are likewise largely uniform in type, being vertical floor cases about 10 feet high and perhaps 6 feet square. These are raised from the floor about 8 inches by legs. Such cases would usually be considered too large and deep for the proper display of small specimens, but by the use of a set of shelves narrowing toward the top, a pyramidal installation is secured, and even small specimens show up surprisingly well. The case interiors are cream white. Where wall cases are desired a case half the thickness, but of the same type, is employed. The top and often the sides of the case are fitted with ground glass. The doors are fastened by a vertical rod on the outside. The sashes of each door are so arranged as to have three long panes along the line of vision, with a row of shorter panes above and below. Thus the immediate field of ordinary vision is made large and glass is economized. The shelves are of glass and are supported on brackets of simple angle irons which are screwed to the wall plates with thumbscrews, or fit into a series of slots. Quite as often the brackets are fastened in front and project backward the width of the shelf, the evident purpose being to bring the contents of the case as near the eye as possible. The rows of slots are covered by thin strips of metal painted the color of the case interior, and thus the unsightly holes which usually accompany adjustable shelves are not to be seen. The metal and glass plan is followed throughout, even the trays used to hold the specimens, and the label holders, being of tin, while

wire is used for any special support. Thus there is nothing in the case or mounts capable of decay or of producing dust. Dust from the floors is further reduced to a minimum by having them covered with linoleum. The use of curtains in the cases is another unique feature. These are of the ordinary window-shade type and are let down in the middle, dividing the case into two parts and giving backgrounds. By the employment of curtains of different colors, pleasing effects are produced. The collection of corals and siliceous sponges, for example, is seen against a black curtain, the collection of jade against a red curtain, and a collection of Chinese pottery against a curtain of Oriental type. The division of the collections seemed to me likewise commendable in that it was well calculated to arouse the interest of the average visitor. Instead of the usual rows of genera and species arranged in synoptic order, the whole effect of which is first to impress the visitor with the fact that he knows nothing of that science, and second to convince him that he does not care to, there are small collections gathered around some common name or common idea from which study is led out to a wider field. Thus one case is devoted to a collection of doves, another to one of men-like apes, another to birds' nests, etc. There are provided in abundance tables, chairs, and books relating to the collections which invite to further study. Where space does not permit tables, a sloping shelf, fastened to one of the pillars or walls of the building, is used for a book support. Framed maps, colored to show the distribution of species, are also hung freely about. The zoölogical-ethnographical museum is open Sundays, Mondays, Thursdays, and holidays from 11 to 1, and Wednesdays and Saturdays from 1 to 3, free. It is closed Tuesdays.

Munich. — The important natural history collections in this city are to be seen in the building of the Academy of Science. This is a plain rectangular building of several stories, lighted by side windows. The mineralogical collection is to be found on the first floor, the paleontological on the second. The mineral collection is a choice and valuable one, the 4,500 specimens exhibited being but a tenth of the entire collection. The col-

lection is especially rich in rare and showy minerals of the Urals and the Tyrol. The collection is installed in vertical wall and "A" floor cases, the case interiors being colored maroon. The specimens are mounted on red or black walnut blocks. The meteorite cases are kept dry within by means of open dishes of sulphuric acid. For the deliquescent Stassfurt and other salts, a square jar, ground at the top to a bevel and fitted with a glass lid, is employed, and the specimens so installed show to much better advantage than in the usual museum jar. The collection of single crystals (a very large and choice collection) is shown in short "A" cases which have a steep slope and are fitted with narrow step shelves. By such an installation the eye of the observer can be brought close to the specimen, a most desirable arrangement for the study of objects so small. The crystals are mounted on wooden stands of the usual type. In the general collection index fingers are used freely on the specimens to point out individual crystals. The collection is divided into the terminological, systematic, genetic, and technological collections. In the terminological collection are illustrated structure, color, form, and luster of minerals, crystal form, growth of crystals, inclusions, crystal aggregates, and pseudomorphs. The systematic collection is arranged according to Groth's classification. The genetic series begins with the collection of meteorites, then follow rock-forming minerals and rocks, native salts, secondary minerals, and ores. The technological collection is intended to illustrate ores and minerals of economic importance with their products. There are shown in order ores of gold, mercury, silver, lead, tin, bismuth, antimony, zinc, iron, cobalt, nickel, manganese, and aluminium; then a series showing minerals used in the arts, such as materials for making glass, magnesite, strontianite, saltpetre, uraninite, chromite, borax, asphalt, ozocerite, asbestos, talc, mica, graphite, lithographic stone, Iceland spar, emery, tripoli, ornamental stones, and a series of gems showing the varieties of color exhibited by each species. Such a classification is well conceived and might be made most instructive if well executed, but, as is usual with such collections, insufficient care has been bestowed on the installation,

and many manufacturers' gifts have been introduced, so that the balance of the series is destroyed. A readable as well as exhaustive handbook, descriptive of the collection, is for sale by the attendant.

The paleontological collection is one of the largest in Europe. It is especially rich in mammals, reptiles, and fishes of North America. It is divided into three collections. In the first the fossils are arranged according to their biological order; in the second, according to their order in time; while the third is a local collection of fossils of Bavaria. Wall and floor cases of hard wood are used; the former of the usual type, the latter, desk cases with tops of a low slope. The smaller specimens are mounted on cardboard, the larger on bases of plaster or wooden blocks painted white. Most of the incomplete skeletons are restored, but a few, especially fishes and reptiles, are mounted upon wire frames, on which each bone has its proper place. While nothing especially novel in methods of installation was noted, the extent and variety of the material in this collection are such as to make it especially worthy of study. Among many specimens of great interest are a nearly complete skeleton of *Rhinoceros tichorinus*, found in a moraine near Ascham in Innthal; a complete skeleton of *Titanotherium trigonoceras*, and two skulls of the same genus; complete skeletons of the cave bear, of *Rhinoceros* and *Hipparion*, of *Dinornis*, and of many smaller species. Remains of an *Ichthyosaurus* from Boll, Württemberg, show two young in the womb of their mother, thus giving proof of the viviparous character of the species. Other specimens show clearly the heterocercal tail. The fossils from the Solenhofen beds are superior in quality and quantity, some being remarkably vivid in their representation of ancient life. On one specimen may be seen tracks of a *Limulus* made for a short distance, and at the end the animal itself. Another specimen shows the trail of a mollusk made on the sand, ending with the mollusk itself.

Berlin: Naturhistorisches Museum. — The methods of installation employed in this museum have been so fully described by Dr. Hovey that little need be added. As in all other

museums which I saw constructed on the plan of galleries or halls around a central roofed court, the lighting is poor, so that much of the material cannot be seen satisfactorily. The rock collection, however, installed in flat floor cases, in a hall with side windows, is admirably lighted, and shows that such a combination may be satisfactorily used for obtaining good light. In the zoölogical halls, metal-framed cases, similar to those of the Dresden Museum, are employed. The same plan of group collections is also carried out, collections being exhibited which illustrate such features as varieties and differentiation of bone, skin, etc.

The Museum of the School of Mines adjoining has much important material and most of it well exhibited, but my time was too short to permit any study of its methods.

Zurich.—In the handsome Polytechnic Building are contained extensive geological and zoölogical collections, which are open to the public free one day in the week ; on other days admission is 50 centimes. The geological collection, built up chiefly by Professor Heim, is extensive and well cared for. The collections of minerals, rocks, and general geology are installed in floor cases of hard wood with sloping tops, no vertical wall cases being used. The collection here of greatest interest is that illustrating general geology. It is arranged upon a classification first proposed by Professor Heim, and is intended to illustrate the processes of formation, alteration, and decay which go on in the earth's crust. The classification, which is worth noting, is on the following page.

Each of these divisions is illustrated by specimens of the objects named, many of which are unique and striking. The proximity of the Alps has given an opportunity of which Professor Heim has made good use, for procuring the most vivid specimens. There are also shown, under each division, illustrations of the different phenomena as occurring in both recent and ancient time, as far as possible. Thus the collection as a whole gives a novel and effective presentation of the subject of general geology. The paleontological collection is large and well installed. Remains of the large quaternary mammals of

ROCK FORMATION.	ACTION OF AIR.	{ Surfaces polished by wind-blown sands, coloring and splitting produced by sun's heat, loess, fulgurites, etc.
	ACTION OF WATER.	{ CHEMICAL EROSION. Pittings on limestone, gypsum, etc. CHEMICAL ALTERATION. Kaolin, clay, limonite, serpentine, etc. CHEMICAL DEPOSITION. a. Dendrites, amygdules, geodes, etc. b. In springs. Travertine, siliceous sinter. c. In lakes. Clay-iron-stone, oölitic limestone. d. In seas. Gypsum, anhydrite, salt, etc.
		MECHANICAL DEPOSITION. River gravels, sand and silt; beach gravels, sand and silt; conglomerates, sandstones, etc.
	ACTION OF LIFE.	{ GLACIAL PHENOMENA. Glaciated pebbles, moraine materials, scored and polished surfaces.
		{ EROSION AND DEPOSITION BY PLANT LIFE. Rocks pitted by humus acids. Coal, peat, lignite, diatomaceous earth, petrified wood, etc.
		{ EROSION AND DEPOSITION BY ANIMAL LIFE. Rocks bored by mollusks. Animal remains, limestones, chalks, etc.
	ACTION OF THE EARTH'S INTERIOR.	{ Volcanic products, ashes, lavas, tuffs, etc.
ROCK DEFORMATION.		{ Folded and crumpled rocks, stylolites, slickensides, etc.

South America form a feature. Of these only the actual bones are mounted, no attempt being made to restore the missing parts. While this method has the advantage of truthfulness, it cannot be said to produce a pleasing effect. To see, for example, scattered limb bones, vertebræ, and ribs of a *Megatherium*, mounted in the upright position of the animal, but with no head, gives a grotesque and ludicrous impression rather than one calculated to encourage scientific study.

Bern. — The Natural History Museum, built by A. Jahn in 1879–81, is a handsome stone building of three stories. The mineralogical and paleontological collections occupy the ground floor, the zoölogical the two upper floors. The alcove system of installation is employed and good lighting is secured. Both installation and labeling are neat and careful throughout, and one has a general sense of comfort and satisfaction in looking through the museum. Of greatest interest is the magnificent collection of crystals from the St. Gothard. One perfectly clear crystal of smoky quartz is $3\frac{1}{2}$ feet long and 2 feet in diameter; another, doubly terminated, is 4 feet long. There are also large and showy groups of albite from the same region and of epidote from the Untersulzbachthal. Of interest in the paleontological collection are perfect skeletons of the cave bear and Irish elk. The museum is open free three hours a day on Tuesdays, Saturdays, and Sundays; on other days admission is one franc.

Neuchâtel. — The natural history collections exhibited in the Collège Latin are extensive and of permanent interest for their association with the memory of the great naturalist who founded them. The collection of fishes is unusually large, as is also the collection of marbles. The animal groups by Challande are also unique and attractive and embody an idea which one could wish to see more widely carried out. The installation is, however, in general antiquated, and while perhaps the best that funds will allow, furnishes an impressive illustration of the advance in museum methods since this collection was established. The cases employed are flat-topped floor cases and

vertical wall cases. They are painted white and the panes are of small size. The bases of the wall cases are so high that the specimens are almost out of sight. The halls are lighted by side windows. The museum is open to the public only six hours a week — four hours on Thursdays and two hours on Sundays.

Paris: Muséum d'Histoire Naturelle and École des Mines. — I have little to add to Dr. Hovey's admirable account of these museums. Nothing could better illustrate the advance which has taken place in museum methods in the last thirty years than to contrast the mineralogical museum in the Jardin des Plantes, having varied modes of installation, confused arrangement and cheaply framed cases, with the new paleontological museum having cases almost wholly of glass, and collections made up of consecutive series of exquisitely prepared and carefully labeled specimens. Similarly the advance which has been made in methods of collecting and in an understanding of what constitutes a "specimen" is well evinced by a comparison of the Haiiy collection in the mineralogical museum, made up as it is of many insignificant fragments, with any decent mineral collection of to-day. Such contrasts show clearly how great are the possibilities of museum representation and the need of constant study for its improvement. Of single features, the notices to the public which take the place of the rude English "Hands off" or "Touch not" deserve imitation. They read as follows:

"Les pieces de cette galerie, étant très fragiles, sont confiées à la garde du public. On est prié de ne pas y toucher." (The specimens in this hall, being very fragile, are confided to the care of the public. It is requested that they be not handled.)

The museums of the Jardin des Plantes are open Sundays and Thursdays from 11 to 4, and by ticket on Tuesdays, Fridays, and Saturdays for the same hours. The École des Mines collections can be seen only Tuesdays, Thursdays, and Saturdays from 1 to 4.

London: British Museum (Natural History). — The character of this great museum and the methods of installation

employed are so generally known that any detailed description would be superfluous. The possibilities of a museum as an institution seem here to be as fully realized as is possible in the present state of museum knowledge. The well-lighted building, the extensive collections along all lines of natural history, the rich and careful installation, the perfect neatness, the complete labels, and the clear and comprehensive handbooks, all combine to show what a museum can do as a great storehouse of instruction.

Of single features the mount of jeweler's cotton for mineral specimens is worthy of note. It furnishes a neutral background and does not show dust. Instead of being described as forced into a groove, as Dr. Hovey has it, however, it should be said that the cotton is folded around a cardboard which fits the tray. This makes in one sense a groove, but is an easier mode of manipulation than the other. This mount is not used for all specimens where another background would give a better effect. Specimens of *flos ferri*, for instance, are mounted on purple velvet. Single gems are exhibited in shallow cups of celluloid. The crystal mounts are ebonized, conical bases tapering to a long slender rod, on the end of which the crystal is fastened. The rod, it may be said, is too long to suit the writer's taste. In labeling the species, if there are a number of specimens from different localities, only the locality is given on the specimen label; the species' name is shown on a label raised on a brass support and placed in the center of the group. The low installation employed for the mineral collection, while perhaps giving the best lighting to the specimens, to the writer's mind, does not make for the hall so attractive an appearance as could be obtained by the use of cases which would give a glimpse of their contents at a distance. The exhibition of specimens at the bottom of desk cases, at any rate, seems entirely useless. The meteorites are exhibited in pyramidal "A" cases fitted with a pyramidal series of shelves. The specimens are mounted on mahogany bases. The instructive collections introductory to the study of rocks, minerals, and meteorites deserve the highest praise. Wrought out in exquisite detail, the labels couched in clear and simple language, and with

every possible feature illustrated by specimens, the collections serve in the highest degree to show what such productions can do as mediums of instruction. In the paleontological collection vertical cases arranged on the alcove system are employed, interspersed with pyramidal "A" cases, in which the smaller specimens are shown. Every effort is put forth by the use of photographs, wash drawings, models, and descriptive labels to make the collections instructive. In connection with the vertebrate fossils there are even exhibited mounted skeletons of the modern elephant, rhinoceros, etc., in order to make clear by comparison the structure of the ancient mammals. Such an exhibit is most admirable but is possible, of course, only to museums of the largest size.

Museum of Practical Geology, Jermyn Street.—The plan of the museum building is that of tiers of galleries around a central roofed court. The lighting from above causes bad reflections in the flat cases around the court. The vertical cases are better lighted, but are narrow, necessitating upright installation, which is often inconvenient. The practical purposes of the museum have been kept in mind in the make-up of the collections, but, as seems often to be the case, the collections gathered on scientific lines are outgrowing those of economic interest. Among methods of installation I noted specially the mode of exhibiting maps. They are hung rolled on spring rollers from the edge of the gallery, whence a descending tassel permits the visitor to draw the map down for examination. Space is thus economized and the maps are better preserved. The large slabs of Ichthyosaur and Plesiosaur remains are framed and covered with glass, thus enhancing the appearance of the specimens and serving for their better preservation. An excellent handbook to the museum makes a study of the collections easy and interesting.

British Museum.—I have but a single note to quote of this museum, though much might be said of it in approval. Gems are displayed by being set in a frame placed in the outer part of a case with sloping sides, in the interior of which mirrors are

placed so as to reflect light *through* the stone. Thus the true color and luster of the stone are displayed as they could not be against an opaque background.

Oxford. — There is much valuable material in the geological collections of the University Museum, but it is largely hidden by the installation. The great series of Lyme-Regis specimens and much of the Prestwich collection, being piled in dark, deep wall cases and with few labels, are of little use to visitors. The minerals and rocks, now being installed in flat cases, show a beginning of better things, but the table cases used have a temporary look at best.

Bath. — The collections of the Moore Geological Museum owe their origin chiefly to the labors of Mr. Charles Moore. They are largely illustrative of the geology of the surrounding district, and of this field give an excellent representation. The display of Ichthyosaur and Plesiosaur remains is especially fine and probably unsurpassed outside of the British Museum. Here also are the remains of the diminutive *Microlestes*, which were found by carefully picking over three tons of clay. Wall cases and a gallery are the method of installation employed in one of the halls, while floor desk cases with tops of low slope occupy another. Most of the specimens are exhibited in paste-board trays. The arrangement is primarily stratigraphical, and under each stratigraphical division zoölogical. The boundaries of each stratigraphical division are indicated by wide mahogany sticks, and those of the zoölogical groups by narrower black sticks. Figured specimens have green labels. A box of suggestive shape, with a suggestive slot and suggestively near the exit, is labeled "Contributions to the geological collection," thus making a not unreasonable request that those who derive instruction from well-arranged and well-cared-for collections shall contribute toward their maintenance.

Bristol. — The zoölogical collection is upon the ground floor, the geological upon the second floor of the building, modeled after the Doge's Palace in Venice, which constitutes the home

of the city library and museum. The model is hardly one worthy of imitation in museum architecture, especially on account of the outer arcade, which, though it doubtless adds to the beauty of the building, cuts off much of the light so essential to museum display. The geological collection is installed in floor desk cases. The fossils and minerals shown are chiefly local, but the region is one exceptionally rich in its representation of the strata of different ages. Type specimens are indicated by disks of yellow paper, figured specimens by green. Casts and maps are hung about to some extent. The minerals are grouped in an unusual fashion, the divisions being silica, silicates of alumina, lime minerals, and metallic ores with iron. This may be better than no grouping at all, but it cannot be said to teach anything of value. The installation as a whole shows lack of care, the case interiors being dusty and the specimens likewise. The labels are written with poor ink and many are hardly legible. Hence while there are many rare and showy specimens in the collection, and while the lighting of the upper floor at least is good, one is soon overcome by "the musty feeling," which, though once supposed to be a necessary concomitant of museums, now, happily, survives in but few.

Edinburgh.—The Museum of Science and Art combines the functions which its name indicates. The first-named function is apparently the more prominent, but the combination with the second (made to include industrial art) gives a pleasing character. It is one of the few museums which have succeeded with the experiment of evening opening. The evening attendance indeed is larger than that in the daytime. The hours of visiting are from 10 A.M. to 10 P.M., free on Mondays, Wednesdays, and Fridays. On other days admission is sixpence. The plan of the museum building seems unfortunate in some respects, as it is of the type which has been not unaptly termed "well construction," *i.e.*, tiers of galleries round a central roofed court. In such a building few visitors are likely to climb to the upper floors, and the lighting of many of the halls is necessarily poor. In the collections exhibited much attention is

paid to what is practical as well as scientific. There are many models shown, many illustrations of industrial processes, and many illustrations of the uses to which natural products can be put. There are many styles of cases employed, though perhaps not of choice. A combination of half of a flat and half of an upright case is much used for a wall case, though vertical wall cases are being gradually used to replace these. The latter cases are fitted with plate-glass shelves, which rest on T-shaped bars extending across the case and capable of being adjusted in height by fitting into a series of slots in wall plates which run vertically. The door jambs of the cases are fitted with velvet, against which the door is screwed by bolts at top and bottom, turned with a hand wrench, so as to effectually keep out dust. A pyramidal floor case, about 8 feet long, 2 feet wide, and 7 feet high (the base and legs being 2 feet high), is used in the hall of Scottish minerals. The form of the case cannot be said to be altogether attractive, but the lighting of the specimens is admirable. The shelves in this case are fastened to a central upright partition. The arrangement of the collection of fossils is wholly zoological. The mineral collection is classified on Dana's system. Several halls are devoted to a representation of the geology of Scotland, to illustrate which and the work of the Geological Survey, an exhaustive collection has been prepared. Maps of each district are shown, and in the adjoining cases are elaborate series of the rocks or fossils of the district. Photographs and transparencies, showing photomicrographs of the rocks, also add to the completeness of the exhibit. An extensive collection of the minerals of Scotland is also shown. An aquarium hall containing living fish attracts much popular attention.

General Conclusions. — If a museum building is on more than one floor or has its halls arranged in any other way than to favor a consecutive line of progress, the upper floors and side halls will not receive equal attention from visitors. If the building is of several stories, the windows should be high and face without; the plan of tiers of galleries around a central roofed court has many disadvantages.

Cases should be of uniform pattern (units) if possible. Their form will be determined by the lighting of the building. If this light is from above, vertical wall and floor cases should be used; if from the side, cases with flat or sloping tops. Metal framework for the cases has the advantages of tenuity and durability. All specimens should be cased, both for purposes of preservation and attractiveness. No pains or means should be spared to make installation rich, neat, and attractive; the most valuable material may be rendered practically worthless for museum purposes by poor installation, and *vice versa*.

The indefinite extension of synoptic or systematic collections is not a desirable effort for a people's museum. Such collections weary by their monotony and extent without teaching any adequate lesson. Group collections formed about some commonly understood idea are more attractive and instructive. To make such collections requires more time, thought, and care than to string out genera and species, but they are more than correspondingly valuable. The economic relations of things can, at least, be shown without much effort, but if this is done, care should be taken that classification is adhered to closely, and the collection kept well balanced.

Museums should cultivate home fields and aim to represent most fully the materials of their own districts in the same proportion and for the same reason that local interests and acquaintances are larger and more important than those at a distance. Thus the best collection of the fossils of the Paris basin should be, as it is, in Paris; of the minerals of Cornwall, in the British Museum; of Prussian amber, in the Berlin Museum.

As to form and style of labels, there can be little question of the superiority of the printed label, made as descriptive as possible. Case labels are very desirable, since they serve, like the headlines of a newspaper column, to show at a glance the character of the contents. In the Continental museums the need of labeling seems to be less generally recognized than in those of Great Britain and our own country. Specimens often have no label, and if they do have labels, they are usually simple statements of name and locality written on paper.

The Continental museums are also open for but remarkably few hours to the public. To illustrate this I have taken the trouble to quote the hours of a number in the preceding pages. Both of these peculiarities indicate that the old conception of a museum as a storehouse still predominates on the Continent. Yet the possibilities of a museum as a medium of public instruction, which are at present probably best understood and exemplified in the museums of Great Britain and America, are fast becoming appreciated on the Continent as well.

In conclusion, I have no better word than to quote a sentence spoken to me in conversation by Dr. Traquair, the able Keeper of the Natural History Collections of the Edinburgh Museum: "The first duty of a scientific museum is to teach science; of a curator, to preserve his specimens."